DEC 20 1999

No. 99-6723

Supreme Court, U.S.
FILED
DEC 20 1999
OFFICE OF THE CLERK

IN THE

Supreme Court of the United States

ANTHONY BRADEN BRYAN,

Petitioner,

v.

MICHAEL MOORE, Secretary, Florida Department of Corrections,

Respondent.

ON WRIT OF CERTIORARI TO THE SUPREME COURT OF FLORIDA

BRIEF OF PHYSICIANS FOR HUMAN RIGHTS, GLOBAL LAWYERS AND PHYSICIANS, SOCIETY OF GENERAL INTERNAL MEDICINE, AMERICAN NURSES ASSOCIATION AND AMERICAN PUBLIC HEALTH ASSOCIATION AS *AMICI CURIAE* IN SUPPORT OF REVERSAL

MARTIN J. NEWHOUSE
Counsel of Record
CRYSTAL D. TALLEY
KIMBERLY L. PEDERSEN
ELAINE J. GOLDENBERG
ROPES & GRAY
One International Place
Boston, Massachusetts 02110
(617) 951-7000

Attorneys for Amici Curiae Physicians for Human Rights, et al.

156880

Counsel Press LLC
(800) 274-3321 • (800) 359-6859

24pp

TABLE OF CONTENTS

	Page
Table of Cited Authorities	ii
Interest of the *Amici Curiae*	1
Summary of the Argument	3
Argument	5
I. It Is Undisputed That The Physiological Effects of Electricity are Extremely Painful	5
II. There Is A Substantial Risk That Inmates Remain Conscious For Some Period Of Time During A Judicial Electrocution	8
Conclusion	18

TABLE OF CITED AUTHORITIES

Page

Cases:

Fierro v. Gomez, 865 F. Supp. 1387 (N.D. Cal. 1994), *aff'd*, 77 F.3d 301 (9th Cir.), *vacated*, 519 U.S. 918 (1996) 13

Jones v. Butterworth, 695 So. 2d 679 (Fla. 1997) ... 3

Jones v. State, 701 So. 2d 76 (Fla. 1997) 3

Poyner v. Murray, 507 U.S. 981 (1993) 6

Provenzano v. Moore, __ So. 2d __, 1999 WL 756012 (Fla. Sept. 24, 1997) 3

Other Authorities:

1993 Report of the AVMA Panel on Euthanasia, 202 JAVMA 230 (Jan. 15, 1993) 4

Arnold Beichman, *The First Electrocution*, 35 COMMENTARY 410 (May 1963) 3

Theodore Bernstein, *Electrical Injury: Electrical Engineer's Perspective and an Historical Review*, ANNALS OF NEW YORK ACADEMY OF SCIENCES, May 1994 17

HARRISON'S PRINCIPLES OF INTERNAL MEDICINE 859 (Eugene Braunwald et al. eds., 11th ed. 1987) 9

Cited Authorities

Page

Nisha Chibber Chandra et al., *Clinical Predictors of Myocardial Damage After High Voltage Electrical Injury*, 18 CRITICAL CARE MED. 293 (1990) 11

MacDonald Critchley, *Electrical Injuries*, LANCET, Nov. 2, 1935 ..... 5, 10

MacDonald Critchley, *Neurological Effects of Lightning and of Electricity*, LANCET, Jan. 13, 1934 17

Martin R. Gardner, *Executions and Indignities - An Eighth Amendment Assessment of Methods of Inflicting Capital Punishment*, 39 OHIO ST. L.J. 96 (1978) 3

IAN GRAY & MOIRA STANLEY, A PUNISHMENT IN SEARCH OF A CRIME (1989) 10

Baiba J. Grube et al., *Neurologic Consequences of Electrical Burns*, 30 J. TRAUMA 254 (Mar. 1990) 11

J.P. Guinard et al., *Myocardial Injury After Electrical Burns: Short and Long Term Study*, 21 SCAND. J. PLAST. RECONSTR. SURG. 301 (1987) 16

C.E. HARTFORD, CARE OF THE CRITICALLY ILL PATIENT (J. Tinker & M. Rapin eds., 1983) 6, 7

Cited Authorities

Page

Harold Hillman, *An Unnatural Way to Die*, 27 NEW SCIENTIST 278 (Oct. 1983) 3, 8, 9

Harold Hillman, *The Possible Pain Experienced During Execution By Different Methods*, 22 PERCEPTION 745 (1993) 5, 6, 11, 12, 13, 17

John L. Hunt et al., *The Pathophysiology of Acute Electrical Injuries*, 16 J. TRAUMA 335 (1976) ... 9

Thomas N. James et al., *Cardiac Abnormalities Demonstrated Postmortem in Four Cases of Accidental Electrocution and Their Potential Significance Relative to Nonfatal Electrical Injuries of the Heart*, 120 AMERICAN HEART J. 143 (July 1990) 12, 15

PRINCIPLES OF NEURAL SCIENCE (Eric R. Kandel et al. eds., 1991) 6

John G. Leyden, *Death in the Hot Seat: A Century of Electrocutions*, WASH. POST, Aug. 5, 1990 ... 3

Sherwin Nuland, *Cruel and Unusual*, N.Y. TIMES, Nov. 9, 1999 4

Bernard M. Patten, *Lightning and Electrical Injuries*, 10 NEUROLOGY OF TRAUMA 1047 (Nov. 1992) 12, 16, 17

A. Sances, Jr. et al., *Electrical Injuries*, 149 SURGERY, GYNECOLOGY & OBSTETRICS 97 (1979) 11, 12

Cited Authorities

Page

V. Garcia-Sanchez & P. Gomez Morell, *Electric Burns: High- and Low-Tension Injuries*, 25 BURNS 357 (Dec. 1998) 9, 10

WILLIAM A. SCHABAS, THE DEATH PENALTY AS CRUEL TREATMENT AND TORTURE (1996) 4

Joseph Still et al., *Electrocution Due to Contact of Industrial Equipment with Power Lines*, 23 BURNS 573 (1997) 11

NEGLEY K. TEETERS, HANG BY THE NECK (1967) 15

HANDBOOK OF CLINICAL NEUROLOGY (P.J. Vinken & G.W. Bruyn eds., 1975) 5, 17

INTEREST OF THE *AMICI CURIAE*[1]

Physicians for Human Rights is an organization of health professionals, scientists, and concerned citizens that uses the knowledge and skills of the medical and forensic sciences to investigate and prevent violations of international human rights and humanitarian law. In addition to its various initiatives, Physicians for Human Rights works to prevent medical complicity in torture and other abuses. Physicians for Human Rights conducts educational training projects for health professionals, members of the judiciary, and human rights advocates on the application of medical and forensic skills in the investigation of violations of human rights. In recognition of its accomplishments, Physicians for Human Rights shared in the 1997 Nobel Peace Prize for its work on the steering committee of the International Campaign to Ban Landmines.

Global Lawyers and Physicians works to protect the human rights and dignity of all persons. Its goal is to provide support and assistance in developing, implementing, and advocating public policies and legal remedies that protect and enhance human rights in health. Global Lawyers and Physicians also co-directs the Boston Center for Refugee Health and Human Rights, whose mission is to prevent torture and aid survivors of torture.

The Society of General Internal Medicine is an international organization of physicians and others who

1. Pursuant to Rule 37.6 of the Rules of the Supreme Court of the United States, the *amici curiae* state that no counsel for either party has authored this brief in whole or in part and no person or entity, other than the *amici curiae*, their members, or their counsel, has made a monetary contribution to the preparation or submission of this brief.

combine caring for patients with education and research. It is dedicated to improving patient care, education, and research in general medicine, as well as to promoting social responsibility.

The American Nurses Association ("ANA") is an association of registered nurses that is dedicated to the advancement of the goals and interests of registered nurses and of the nursing profession generally. It was founded in 1897 to promote the professional and educational advancement of nurses. The ANA represents approximately 185,000 nurses in the United States and its territories through its 54 constituent member organizations. The ANA establishes professional standards for nursing practice, nursing education, and nursing services as well as a code of ethical conduct for nurses.

The American Public Health Association ("APHA") is a national non-profit organization devoted to the promotion and protection of personal and environmental health. Founded in 1872, APHA is the largest public health organization in the world, representing over 50,000 public health professionals. It represents all disciplines and specialties in public health.

The *amici* are familiar with the medical evidence relevant to whether the electrocution process causes intense pain, and are concerned about the risk of a prolonged, torturous death. Because an informed discussion of this evidence will illuminate the question presented to the Court, the *amici* are filing this brief to aid the Court's resolution of this case.

SUMMARY OF THE ARGUMENT

From its first use in 1890 in New York to the present, electrocution as a method of judicial execution has been described repeatedly as "torture," akin to medieval methods such as boiling in oil. *See, e.g.*, Arnold Beichman, *The First Electrocution*, 35 COMMENTARY 410, 415-18 (May 1963); John G. Leyden, *Death in the Hot Seat: A Century of Electrocutions*, WASH. POST, Aug. 5, 1990, at D05 ("The New York Herald called the execution [in 1890] 'death by torture.' "); Harold Hillman, *An Unnatural Way to Die*, 27 NEW SCIENTIST 278, 278 (Oct. 1983) ("He feels himself being burnt to death. . . . It must feel very similar to the medieval trial by ordeal of being dropped into boiling oil.").

While there is no dispute that application of an electrical current of the magnitude used in a judicial electrocution affects the body in ways that would ordinarily cause tremendous pain, what is disputed is whether the inmate suffers no pain due to immediate brain death. However, no study definitively shows that intentional electrocution causes immediate brain death. *See* R2. at 705.[2] Because of a lack of research, there is in fact no scientifically valid data to support the claims advanced in favor of electrocution as an immediate and painless means of execution. *See* Martin R. Gardner, *Executions and Indignities - An Eighth Amendment Assessment of Methods of Inflicting Capital Punishment*, 39 OHIO ST. L.J. 96, 125 (1978); Hillman, *An Unnatural Way to Die*, *supra*, at 278 (noting that "[t]here is no reason whatsoever to believe that the condemned person does not

2. Citations to "R1." refer to the April 1997 hearing in *Jones v. Butterworth*, 695 So. 2d 679 (Fla. 1997). Citations to "R2." refer to the July 1997 hearing in *Jones v. State*, 701 So. 2d 76 (Fla. 1997). Citations to "R3." refer to the July 1999 hearing in *Provenzano v. Moore*, __ So. 2d __, 1999 WL 756012 (Fla. Sept. 24, 1997).

suffer severe and prolonged pain"). The reason for the lack of research is simple: conducting such research on human beings would amount to torture. *See* R2. at 422. In fact, ironically, research on this method of electrocution is not even conducted on animals, because it is considered inherently cruel.[3] *See* WILLIAM A. SCHABAS, THE DEATH PENALTY AS CRUEL TREATMENT AND TORTURE 163 (1996). Because studies of the onset of death and/or unconsciousness during judicial electrocution cannot be conducted, it is impossible to establish with any degree of medical or scientific certainty the truth of the claim that electrocution provides an instant and painless death.

To the contrary, to the extent that scientific data is available despite a dearth of direct research, the medical and scientific literature and the expert testimony in this case strongly support the proposition that death by electrocution, even when carried out without technical failure or mistake,[4] can be quite the opposite: an unreasonably prolonged and torturous experience.

---

3. When animals are euthanized by electrocution, "[i]t is imperative that [they] be unconscious before being electrocuted" because "animals do not lose consciousness for 10 to 30 seconds or more after onset of cardiac fibrillation," the ultimate cause of death. *1993 Report of the AVMA Panel on Euthanasia*, 202 JAVMA 230, 241 (Jan. 15, 1993).

4. Because it is the *amici*'s position that, "[e]ven when functioning exactly as it should, the electric chair is a brutal killer," Sherwin Nuland, *Cruel and Unusual*, N.Y. TIMES, Nov. 9, 1999, this brief does not address the question of so-called "botched" electrocutions, in which the electric chair does not function as intended due to technical failures or human error. Such cases are well documented, as is the suffering inflicted upon inmates in such instances.

ARGUMENT

I. It Is Undisputed That The Physiological Effects of Electricity are Extremely Painful

It cannot be disputed that the magnitude of electricity applied in a judicial electrocution necessarily affects the body in ways that would cause excruciating pain under normal circumstances.[5] As noted by Dr. Harold Hillman, one of the few researchers to publish on the topic of the pain caused by judicial electrocution, medical evidence suggests that judicial electrocution is quite painful. *See* Harold Hillman, *The Possible Pain Experienced During Execution By Different Methods*, 22 PERCEPTION 745, 750 (1993) (concluding that judicial electrocution would be a painful method of execution, citing evidence that defibrillation is painful, electric burns are painful, electricity is used for torture, and a survivor of the electric chair felt pain). A seminal work on electrical injuries reports that when high-voltage electrical accidents do not cause instantaneous unconsciousness, the victim almost always experiences "an agonizing pain throughout the body." MacDonald Critchley, *Electrical Injuries*, LANCET, Nov. 2, 1935, at 1002, 1003. *See also* HANDBOOK OF CLINICAL NEUROLOGY 686 (P.J. Vinken & G.W.

5. Florida employs an automatic five-cycle electrocution method that lasts for two minutes. *See* R1. Vol. 8 at 157. Between 2250 and 2350 volts are applied during the first cycle, which lasts for eight seconds. *See* R1. Vol. 5 at 133. One thousand volts are applied during the second cycle, which lasts for twenty-two seconds. *See id.* at 134. Both the eight-second "high" cycle and the twenty-two-second "low" cycle are repeated, followed by a final high cycle of sixty seconds. *See* R1. Vol. 8 at 157. Although the system is set to go through all five cycles automatically, according to the record below in practice the cycles are always stopped manually four seconds into the third cycle. *See id.* at 184-88.

Bruyn eds., 1975); Hillman, *The Possible Pain Experienced*, *supra*, at 750. As the current travels through the body, it causes every muscle to violently and completely contract, which is an enormously painful experience. *See* Affidavits of E.B. Ilgren, M.D. ¶20 (hereinafter "Ilgren Aff.") and Dr. Harold Hillman ¶12 (hereinafter "Hillman Aff."), previously submitted to the Court in *Poyner v. Murray*, 507 U.S. 981 (1993) (denial of petition for stay of execution). The contractions can cause the limbs to move violently against the straps, which may result in dislocations or fractures. *See* Hillman, *The Possible Pain Experienced*, *supra*, at 747. *See also* C.E. HARTFORD, CARE OF THE CRITICALLY ILL PATIENT 690 (J. Tinker & M. Rapin eds., 1983). Furthermore, electrical current at the level used in judicial electrocutions causes the body's temperature to rise, heating the body fluids close to the boiling point of water and causing painful swelling of the internal organs. *See* Ilgren Aff. ¶21; Hillman Aff. ¶12. In addition, the high-voltage electrical current applied during a judicial electrocution causes second- and third-degree burns, which would be excruciatingly painful. *See* HANDBOOK OF CLINICAL NEUROLOGY, *supra*, at 720; Ilgren Aff. ¶19. *See also* CARE OF THE CRITICALLY ILL PATIENT, *supra*, at 686. The painful nature of these burns is evidenced by the fact that patients who receive such severe burns and survive are regularly treated with powerful pain reduction medication.[6] *See* Hillman Aff. ¶11.

---

6. Indeed, when tissues are damaged, as with an electrical burn, the sensation of the pain in response to subsequent exposure to the stimulus can be increased. *See* PRINCIPLES OF NEURAL SCIENCE 386 (Eric R. Kandel et al. eds., 1991). That is, the threshold for pain at that location is reduced, and the area becomes hyper-sensitive to pain. *See id.*

As the current travels through the body inflicting the physical pain described above, it can also cause the sensation of pain by directly activating the pain-sensing regions of the brain. Although pain ordinarily is caused by the application of a pain-causing stimulus to a body part, the sensation of pain can also be produced by applying a certain quantum of electrical current to the areas of the brain responsible for sensation of pain. *See* R2. at 372. For example, if an electrical current is applied to the brain cells responsible for sensing pain in the foot, a person will feel pain in the foot, even if there is no external stimulation to the foot causing pain. *See* R3. at 437. Amputees often experience such "phantom limb pain" when the area of the brain responsible for sensing pain in the previously amputated limb is activated. *See id.* Because the regions of the brain that control the sensation of pain are located deep within the brain and thus are protected from the source of the current, it is unlikely that they are instantly destroyed by the initial application of electricity during a judicial electrocution. *See* R3. at 438-39.[7] It is more likely that weaker current reaches the deeper areas of the brain, because electrical current has a tendency to spread out to fill the available space, resulting in current dissipation. *See* CARE OF THE CRITICALLY ILL PATIENT, *supra*, at 682.[8] If only weaker current does reach

7. In addition to the fact that these regions are removed from the source of the current, they are also protected by the skull, which resists the flow of the electrical current. *See infra* pp. 9-10 for a discussion of this point.

8. This concept is known as current density. A given amount of current concentrated in a small area has a higher density than the same amount of current concentrated in a larger area. *See* R3. at 560. As the State's expert conceded, the spreading out of current could be a significant factor in assessing the effect of electrical current on the body. *See* R2. at 1028.

those areas, the pain-sensing regions of the brain are likely activated, *see* R2. at 379, 406, which, in and of itself, would cause the inmate to experience intense pain.

It is important to note that an absence of outward signs of pain from an inmate during a judicial electrocution is hardly evidence that the inmate is not experiencing severe pain. The more likely explanation for a lack of expression is that the manifestations of pain are hidden by the nature of the procedure. *See* Hillman, *An Unnatural Way to Die*, *supra*, at 278. For one thing, the inmate is strapped to the chair at the arms, legs and chest, and a mask covers his head. Further, though it was once believed that a failure to move indicated a lack of pain, it is now known that such a failure could be due to the fact that the muscles are contracted maximally, preventing the inmate from expressing or conveying that pain. *See* Hillman Aff. ¶12. The muscle contraction itself is excruciatingly painful, and is added to the pain of the burning flesh and the heating of the organs as described above. *See id.* The end result is that the inmate "feels himself being burnt to death while he is conscious of his inability to breathe." Hillman, *An Unnatural Way to Die*, *supra*, at 278.

II. There Is A Substantial Risk That Inmates Remain Conscious For Some Period Of Time During A Judicial Electrocution

Though it is undisputed that severe burning of the skin, massive contraction of the muscles, and rapid heating of the internal fluids could result in great pain under normal circumstances, the question at the core of the present debate is whether the inmate being executed by electrocution is conscious, or sufficiently conscious, so as to experience that pain. The precise instant at which consciousness is lost when

electricity is applied to the human body is necessarily on the edge of the unknowable. *See* Hillman Aff. ¶12 (stating that "[a]lthough it is believed by proponents of death by electrocution that the person being electrocuted may lose consciousness and the sensation of pain as soon as electrocution begins, there is no scientific evidence whatsoever to support this belief"); R2. at 655, 743. However, there is *no* evidence that the magnitude of electricity applied during a judicial electrocution necessarily causes immediate brain death, such that pain and suffering are not experienced. *See* Hillman, *An Unnatural Way to Die*, *supra*, at 278; Ilgren Aff. ¶23; Hillman Aff. ¶10; R2. at 677.

During a judicial electrocution it is likely that the magnitude of current that reaches the deep recesses of the brain where the centers of consciousness are located is not sufficient to cause instantaneous unconsciousness. *See* R2. at 385. Electricity tends to follow the path of least resistance, *see* R3. at 485, and there are several layers of highly resistant material between the electrode and the brain. Specifically, between the head electrode and the brain, resistance will be encountered in the skin, the tissue, and the skull. The human skull is likely the most resistant substance in the body, *see* John L. Hunt et al., *The Pathophysiology of Acute Electrical Injuries*, 16 J. TRAUMA 335, 339 (1976) ("Bone has the greatest resistance to current flow of any tissue in the body. . . ."), and can effectively insulate the brain from current, *see* V. Garcia-Sanchez & P. Gomez Morell, *Electric Burns: High- and Low-Tension Injuries*, 25 BURNS 357, 358 (Dec. 1998); HARRISON'S PRINCIPLES OF INTERNAL MEDICINE 859 (Eugene Braunwald et al. eds., 11th ed. 1987) (noting that bone offers relatively high resistance); Ilgren Aff. ¶15. Studies have shown that

the amount of electrical current that actually crosses the skull is 1/20th of the initial current.[9] *See* Hillman Aff. ¶9; R2. at 395. The current that does ultimately penetrate the skull will then encounter the highly conductive cerebral spinal fluid. *See* Critchley, *Electrical Injuries*, *supra*, at 1002 (noting that the best conductive material in the body is cerebral spinal fluid); Garcia-Sanchez, *supra*, at 358; PRINCIPLES OF INTERNAL MEDICINE, *supra*, at 859; R2. at 399. The presence of such fluid will likely divert the current *around* the brain and into the spinal canal. *See* R2. at 399. That significantly smaller amounts of current reach the brain is supported by observations that "[t]he burns appearing inside the scalp are minute compared with those on the skin's surface." Hillman Aff. ¶9. *See also* R2. at 922 ("[Medina's] scalp exhibited the central area of charring . . . but the bone itself was not burned through. In fact, it was not even partially burned."). As a result, it is more likely than not that inmates are not rendered immediately unconscious, *see* R2. at 674-76, 749, and, in fact, consciousness is likely to last for a period of time, *see* R2. at 438. Even Nikola Tesla, the inventor of alternating current, believed that death by judicial electrocution is not instantaneous, stating that alternating current would spread through the body in a manner that could preserve vital organs, "with the result the victim may retain consciousness and experience great pain." IAN GRAY & MOIRA STANLEY, A PUNISHMENT IN SEARCH OF A CRIME 32 (1989).

As no studies have ever measured the brain's electrical activity during an electrocution, *see* R2. at 677, accidental electrocutions and lightning strikes provide the closest

9. The studies have measured movement of current from the inside of the skull to the outside. *See* R3. at 447. However, there is no reason to believe that the movement of current from the outside of the skull to the inside would be different. *See id.*

analogue. Although loss of consciousness does occur after many high-voltage electrical accidents, the medical and scientific literature reports that loss of consciousness is by no means a certainty. Various studies have shown that anywhere from 40% to 55% of patients studied remained conscious after high-voltage accidents with electricity ranging from 3000 to 130,000 volts, a range far exceeding the voltage used in a judicial electrocution. *See* Nisha Chibber Chandra et al., *Clinical Predictors of Myocardial Damage After High Voltage Electrical Injury*, 18 CRITICAL CARE MED. 293, 295 (1990) (explaining that nine out of thirteen patients remained conscious after contact with voltage ranging from 3000 to 130,000 volts); Baiba J. Grube et al., *Neurologic Consequences of Electrical Burns*, 30 J. TRAUMA 254, 255 (Mar. 1990) (stating that 55% of patients studied remained conscious after high-voltage accident); Joseph Still et al., *Electrocution Due to Contact of Industrial Equipment with Power Lines*, 23 BURNS 573, 573 (1997) (stating that seven patients survived and remained conscious when industrial equipment they were touching contacted high-voltage power lines).

If consciousness is retained for some period of time during a judicial electrocution, the mechanisms of death in such cases indicate that consciousness — and thus the sensation of pain — can be more prolonged than is argued by the procedure's advocates. Asphyxiation and ventricular fibrillation are believed to be the primary mechanisms of death in a judicial electrocution. *See* Hillman Aff. ¶13 ("Death results from the cessation of respiration and the heart as well as a cessation of brain functioning."); Hillman, *The Possible Pain Experienced*, *supra*, at 748 ("Death from electrocution could be due to asphyxia caused by paralysis of respiration, and to ventricular fibrillation."). *Cf.* A. Sances,

Jr. et al., *Electrical Injuries*, 149 SURGERY, GYNECOLOGY & OBSTETRICS 97, 99 (1979). Laryngeal asphyxia results when the muscles of the larynx contract and close off the airway to the lungs. *See* Ilgren Aff. ¶24. This mechanism of death is similar to death by strangulation, with death ultimately taking several minutes. *See id.* General asphyxia results when the muscles of the chest contract and prevent the lungs from being able to expand to take in air. *See id.* Once the oxygen supply is cut off in this way, death may take up to several minutes to occur. *See id.* Finally, death by ventricular fibrillation results when the heart ceases functioning,[10] *see id.*, and an individual can remain conscious for upwards of twenty to thirty seconds after its onset, *see* Hillman, *The Possible Pain Experienced, supra*, at 748 ("[S]everal seconds or minutes could elapse during which the condemned person could be conscious." (citations omitted)); R2. at 96, 438.

---

10. It is important to note, though, that while electrical current can fibrillate the heart and cease blood flow, high levels of electrical current can also have the opposite effect. *See* Thomas N. James et al., *Cardiac Abnormalities Demonstrated Postmortem in Four Cases of Accidental Electrocution and Their Potential Significance Relative to Nonfatal Electrical Injuries of the Heart*, 120 AMERICAN HEART J. 143 (July 1990) ("Paradoxically, the effects of electrical current upon the heart can be lifesaving as well as the cause of death, and the difference in the end result depends upon relatively small differences of circumstances."). This is the theory behind an emergency room defibrillator. If the heart were in fibrillation, then the application of anywhere between 5 and 15 amps of current could cause defibrillation and "restart" the heart with a normal heartbeat. *See* R3. at 594. *See also* R3. at 681 (stating that there is an "upper limit of vulnerability" whereby an electric shock exceeding a certain threshold will not cause fibrillation). In fact, one scientist reports that judicial electrocutions have shown that alternating current of 5 to 8 amps can pass through the body without causing permanent arrest of the heart. *See* Bernard M. Patten, *Lightning and Electrical Injuries*, 10 NEUROLOGY OF TRAUMA 1047, 1054 (Nov. 1992).

The evidence suggests that the contention that unconsciousness is *always* instantaneous when an inmate is electrocuted is wrong. To being with as the State's own expert conceded below, consciousness itself can be difficult to determine by mere observation. *See* R2. at 1045. This fact has long been recognized. For example, when the trial court in *Fierro v. Gomez*, 865 F. Supp. 1387 (N.D. Cal. 1994), *aff'd*, 77 F.3d 301 (9th Cir.), *vacated*, 519 U.S. 918 (1996), concluded that execution by use of the gas chamber was cruel and unusual, it commented extensively on difficulties encountered in the observation of consciousness and pain in individuals. The court stated that neither pain nor consciousness is easy to assess. *See id.* at 1400. It further noted that even a physician could not be certain that a person is unconscious "unless that person is completely flaccid, with no body movements," *id.*, and that even if one displayed those characteristics of unconsciousness, there could still be a response to a painful stimulus, *see id.* at 1400 n.9. Even when a person is conscious, the court concluded, it can be difficult to assess the presence and the extent of pain. *See id.* at 1400. Thus, in a judicial eletrocution, while the prisoner may appear unconscious because he may be paralyzed by the current's effects on the muscles and restrained by the straps and mask, this appearance does not remove the risk that he is conscious and sentient for some period of time. *See* Hillman, *The Possible Pain Experienced*, *supra*, at 751; Hillman, *An Unnatural Way to Die*, *supra*, at 278.

The conclusion that unconsciousness occurs instantaneously depends upon the validity of the assumption that the electrical current applied in a judicial electrocution causes immediate and permanent depolarization of the brain, which deprives the brain cells of the ability to return to their polarized state, thereby ultimately leading to death.[11] While it

11. The brain consists of billions of nerve cells which have a positive electrical charge on the outside, and a negative electrical (Cont'd)

is true that intense and prolonged depolarization can cause cell death, *see* R2. at 425, "[it is] extremely unlikely that [the initial current surge in a judicial electrocution] would permanently and instantly depolarize the brain," R2. at 376. *See also* R2. at 674 ("With a degree of medical certainty, I do not believe the brain is instantly, simultaneously depolarized as the current is applied."). If the brain instantly and permanently depolarized, then the State "should be able to give the current for less than one second and be done with it." R2. at 710-11. However, Florida procedure calls for a five-cycle method that can last for as long as two minutes. *See* R1. V8. at 157. Such a procedure hardly seems consistent with, and indeed contradicts, the assumption that the brain is instantly, permanently, and fatally depolarized by the initial application of electrical current.[12]

(Cont'd)
charge on the inside. *See* R3. at 427. When the outside of the cell becomes negatively charged, depolarization, a normal brain function necessary for the perception of external stimuli, occurs. *See* R3. at 427; R2. at 658. After depolarization, the cell gradually returns to its normal state of external positive charge and internal negative charge (*i.e.*, it becomes repolarized). Depolarization can be caused by either the direct application of electricity to the brain, or by the release of a chemical from peripheral nerves, like those in the hand, when a sensation is encountered. *See* R3. at 427. In its normal occurrence in daily life, the ultimate result of depolarization is the firing of an impulse known as an action potential, which is necessary to experience everyday sensations such as light, sound, and pain. *See* R2. at 372.

12. The fact that some states have subjected inmates to a second round of electric cycles when the first round did not cause death is also evidence that there is no certainty that death is instantaneous. *See* R2. at 745.

Despite an attempt by the State to control the path of current in a Florida electrocution by placing electrodes on the head and leg, is that the path of electrical current cannot be controlled once it enters the body, and so a particular amount of electrical current cannot be guaranteed to reach and incapacitate a particular vital organ. *See* R2. at 558-60. According to the inventor of alternating current, the result of a lack of control of the current path when conducting a judicial electrocution is that "[t]he alternating current used . . . does not pass in a direct course, despite all the precautions taken. The current flows along a restricted path into the body and destroys all tissues confronted in this path. . . . In the meantime the vital organs may be preserved . . . ." NEGLEY K. TEETERS, HANG BY THE NECK 448 (1967) (quoting Nikola Tesla) (internal quotation marks omitted).

One indication that the brain continues to function after the application of electrical current is that the heart has been shown to continue functioning. Like the brain, the heart functions on the basis of electrical impulses. *See* James et al., *supra*, at 148 (stating that the heart "has among its special characteristic properties the production and distribution of electrical currents"); R2. at 383. Though it is true that the heart can beat despite a lack of brain function, several experts have noted that the continued activity of the heart after the application of the current in a judicial electrocution strongly suggests that the brain could continue to function, given the extensive protection provided to the brain by the skull and cerebral-spinal fluid, and the lesser protection available to the heart. *See* R3. at 433-34. Because of the extensive protection available to the brain by virtue of the skull, there is no reason to believe that the brain receives more electrical current than the heart. *See* R3. at 434. According to one expert, "[i]t would be possible [to exhibit an agonal pulse even though the brain has been totally destroyed]

. . . but . . . if that much current reaches the brain, there should be sufficient current to reach the heart to cause fibrillation of the heart or cardiac standstill. There's an incompatibility here which is not explained by the electrical engineers." R2. at 216. *See also* R2. at 383-84 ("If judicial execution does not terminate the beating of the heart immediately or throughout the minute of the current application, then there is no reason to think that the same current will stop the electric chemical activity of the brain which also relies on impulse activity. . . ."). Thus, the pulses palpated after the electrocutions of Medina and Tafero, which indicate that their hearts were still capable of electrical activity, suggest that their brains may still have been functioning. *See* R3. at 433. This, in turn, obviously suggests that consciousness persists during a judicial electrocution.

Industrial accidents and lightning strikes provide evidence that it cannot be concluded with scientific or medical certainty that the brain is instantly and permanently depolarized during a judicial electrocution. Such accidents can involve voltages in excess of ten thousand volts. One expert who treated such patients testified that their brains and hearts were not instantly destroyed, though they did sustain massive and severe burns. *See* R2. at 679. In addition, the medical and scientific literature documents the survival of high-voltage electrical shock victims. In one study of ten patients who were either struck by lightning (which reaches one million volts) or who received electric shocks ranging from 16,000 to 60,000 volts, all the victims survived. *See* J.P. Guinard et al., *Myocardial Injury After Electrical Burns: Short and Long Term Study*, 21 SCAND. J. PLAST. RECONSTR. SURG. 301, 302 (1987). Another study reports that 70% of lightning strike victims survived, despite amperage ranging from 25,000 to 500,000 amps and temperatures exceeding 5000 degrees Fahrenheit. *See* Bernard M. Patten, *Lightning*

and Electrical Injuries, 10 NEUROLOGY OF TRAUMA 1047, 1048 (Nov. 1992). Yet another study notes that less than 25% of victims die from lightning strikes each year. *See* Theodore Bernstein, *Electrical Injury: Electrical Engineer's Perspective and an Historical Review*, ANNALS OF NEW YORK ACADEMY OF SCIENCES, May 1994, at 1, 8. These examples support a conclusion that brain function is not invariably instantaneously destroyed by electrocution and that, to the contrary, in some if not all cases brain function — and therefore perhaps consciousness — also persists for some period after the initial application of electricity.

Further, not only is it possible for people to remain conscious during a judicial electrocution, it is also possible that the perception of time during an electric shock is altered, such that a few seconds feels like several minutes. *See* HANDBOOK OF CLINICAL NEUROLOGY, *supra*, at 698 ("There are numerous references in the literature to the apparent slowing down of time under the influence of the [electrical] current."); MacDonald Critchley, *Neurological Effects of Lightning and of Electricity*, LANCET, Jan. 13, 1934, at 68, 70 (explaining that "[a]s with most protracted painful experiences, the sufferer usually feels that the passage of time is inordinately slow, and electrical injuries supply one of the most vivid examples of the prolongation of time"). Furthermore, one must consider that "reaction times — which include the time that motor signals take to go from the brain to the periphery — are maximally up to 1 [second], whereas the blood and oxygen supply last several seconds. Thus there will always be a finite, if variable, number of seconds during which a condemned person feels before he or she becomes unconscious." Hillman, *The Possible Pain Experienced*, *supra*, at 750.

In sum, based on the scientific and medical evidence, a substantial risk exists that the inmate will retain consciousness for some period of time after the initial application of electricity, during which time the inmate will experience intense pain.

CONCLUSION

Based on the evidence discussed above, a substantial risk exists that death and unconsciousness will not be immediate when a judicial electrocution is performed, that the inmate will retain consciousness for some period of time and will experience for that period the intense pain caused by exposure to a massive electrical charge. It is the *amici curiae*'s position that this risk is unreasonable and unacceptable and renders electrocution a brutal and inhumane procedure that should be banned as unconstitutional by this Court.

Respectfully submitted,

MARTIN J. NEWHOUSE
Counsel of Record
CRYSTAL D. TALLEY
KIMBERLY L. PEDERSEN
ELAINE J. GOLDENBERG
ROPES & GRAY
One International Place
Boston, Massachusetts 02110
(617) 951-7000

Attorneys for Amici Curiae
Physicians for Human Rights, et al.

Dated: December 20, 1999